**GENERAL REQUIREMENTS**

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**SPECIFIC SUBSTANCES AND PROCEDURES**

G30.29 Electrophoresis

#### G30.4 Plumbing

Issued August 1999; Revised November 29, 2022

**Regulatory excerpt**
Sections 30.4(1) and (3) of the *OHS Regulation* ("*Regulation*") state:

> (1) Laboratory water faucets with goosenecks must be protected by vacuum breaks meeting the requirements of ANSI Standard ANSI/ASSE 1001-1990, Pipe Applied Atmospheric Type Vacuum Breakers.
>
> (3) The location of an in-line vacuum break must be clearly identified.

Section 4.1 of the *Regulation* states:

> A workplace must be planned, constructed, used and maintained to protect from danger any person working at the workplace.

Section 4.4(2) of the *Regulation* states:

> When this Regulation requires a person to comply with
>
> (a) a publication, code or standard of the Board or another agency, the person may, as an alternative, comply with another publication, code or standard acceptable to the Board, or
>
> (b) practices, procedures or rules of the Board or another agency, the person may, as an alternative, comply with another practice, procedure or rule acceptable to the Board.

**Purpose of guideline**
The purpose of this guideline is to provide information regarding the purpose of vacuum breaks required by section 30.4(1) of the *Regulation*, and to identify other standards acceptable to WorkSafeBC relevant to laboratory plumbing.

**Vacuum breaks and backflow preventors**
The *BC Plumbing Code* requires that connections to potable water systems be designed, installed, and maintained so that substances that may render the water non-potable cannot enter the system. When a hose or tubing is attached to a laboratory faucet, a vacuum break prevents the back-siphoning of contaminated water into the potable water supply used for emergency washing facilities, other laboratory sinks, or water services outside the laboratory. The 2018 *BC Plumbing Code* recommends a laboratory faucet vacuum break (LFVB) as the most suitable back-siphon prevention device for laboratory gooseneck faucets.

An in-line pressure type vacuum break may be installed to prevent back-siphoning simultaneously at several sinks, so long as back-siphoning into any part of a potable water system is prevented and the device supplies the same level of protection as a faucet-mounted vacuum break. Such a device would possibly be installed at a location not immediately visible to workers. The location of the device must be clearly identified in accordance with section 30.4(3) and should be communicated to workers.

**Other laboratory plumbing**
Although section 30.4(1) of the *Regulation* pertains specifically to gooseneck faucets, the *BC Plumbing Code* may require additional backflow prevention devices to ensure premises or zone isolation for laboratory facilities, or on other water usage devices. It is expected that employers will meet applicable requirements of the *BC Plumbing Code* and/or other acceptable standards for vacuum breaks on plumbing not specifically covered by section 4.1 of the *Regulation*. Employers should also be aware that some municipalities require annual testing of backflow prevention devices. Refer to local bylaws for specific requirements.

**Other acceptable standards**
Section 4.4(2) of the Regulation permits employers to comply with other codes or standards acceptable to WorkSafeBC. In addition to *ANSI Standard ANSI/ASSE 1001-1990*, WorkSafeBC deems the following additional standards to be acceptable for the purpose of protecting laboratory gooseneck faucets from backflow:

- *ANSI Standard ANSI/ASSE 1035-2020, Performance Requirements for Laboratory Faucet Backflow Preventers*
- *BC Plumbing Code*
- *CSA Standard CAN/CSA-B64.7-94, Vacuum Breakers, Laboratory Faucet Type (LFVB)*
- *CSA Standard CAN/CSA-B64.7-21, Vacuum Breakers, Laboratory Faucet Type (LFVB)*

#### G30.7 Grossing station ventilation

Issued December 18, 2015

**Regulatory excerpt**
Section 30.7 of the *OHS Regulation* ("*Regulation*") states:

> Laboratory equipment and instruments which may emit harmful quantities of a substance during their operation must be provided with an effective local exhaust ventilation system.

**Purpose of guideline**
The purpose of this guideline is to explain the ventilation requirements that apply to grossing stations.

**Background**
Grossing stations are widely used in various workplaces, such as histology and pathology laboratories. While most grossing stations do not fall within the definition of a "laboratory fume hood" under section 30.7.1 of the Regulation, they are still subject to a number of ventilation requirements. Some of those requirements are highlighted below.

**Ventilation requirements**
Section 30.7 of the Regulation requires laboratory equipment and instruments which may emit harmful quantities of a substance to be provided with an effective local exhaust ventilation system.

Ventilation system requirements are set out in sections 5.60–5.71 of the *Regulation*. Section 5.64 states that air contaminants must be controlled at the source by an effective local exhaust ventilation system. Further, section 5.61 states that a ventilation system for controlling airborne contaminants in the workplace must be designed, installed, and maintained using established engineering principles. Established engineering principles are outlined in publications such as *Industrial Ventilation – A Manual of Recommended Practice* (American Conference of Governmental Industrial Hygienists), *CSA Z317.2-01 Special Requirements for Heating, Ventilation, and Air Conditioning (HVAC) Systems in Health Care Facilities*, and applicable ANSI, ASHRAE, SMACNA, and NFPA standards.

Once installed, the system will be annually tested and regularly inspected and maintained at intervals that ensure it remains effective (inspection and maintenance records should be kept and readily available).

**Recirculation of formaldehyde prohibited**
Section 5.70(1) of the *Regulation* prohibits the recirculation of substances designated under section 5.57(1), such as formaldehyde. Under section 5.57 of the Regulation, the employer must replace designated substances, if practicable, with a material which reduces the risk to workers. If substitution is not practicable, the employer must implement an exposure control plan to maintain workers' exposure as low as reasonably achievable below the exposure limit. The exposure plan must meet the requirements of section 5.54. However, the recirculation of formaldehyde and other designated substances is prohibited.

**Manufacturer's instructions**
As required by section 4.3(2) of the Regulation, the installation, inspection, testing, repair, and maintenance of grossing stations must be carried out in accordance with the manufacturer's instructions, or as specified by a professional engineer.

**Additional considerations**
Before purchasing and installing a grossing station, the following should be considered:

- How the grossing station will be used (e.g., impact of multiple persons needing to work in it at the same time)
- Type of equipment used/stored on the bench during the tasks to be performed (e.g., cutting boards, chemical dispensing, and access to waste containers)
- Integration of splash protection shields into the unit design
- Ventilation failure warnings (visual and audible alarms)
- Effective capture rate at all locations where formalin (or other designated substance) vapours may arise or be generated (consider vapours emitted from the specimen during grossing and disposal activities, waste containers, and chemical dispensing)
- Spill containment, such as a lip on the station
- Adequate lighting
- Whether the station will be running continuously or with controls easily accessible to the worker
- Whether other ventilation in the room interferes with the operation of the grossing station

#### G30.8 Fume hoods

Issued August 1999; Editorial Revision February 1, 2008; Editorial Revision April 14, 2022

**Regulatory excerpt**
Section 30.8(2) of the *OHS Regulation* ("*Regulation*") states:

> A laboratory fume hood must
>
> (a) be connected to a local exhaust ventilation system,
>
> (b) provide average face velocities of 0.4 m/s (80 fpm) to 0.6 m/s (120 fpm) across the operational face opening,
>
> (c) not have face velocities of less than 80% of the average face velocity required in paragraph (b) at any point across its operational face opening, and
>
> (d) not have face velocities of more than 120% of the average face velocity required in paragraph (b) at any point across its operational face opening.

Section 30.8(3) of the *Regulation* states:

> A laboratory fume hood must be located to prevent cross drafts or other disruptive forces from lowering the air flow across the operational face opening to unacceptable levels.

**Purpose of guideline**
The purpose of this guideline is to explain measures that may be taken by small laboratories or mobile laboratories that may have difficulties meeting the requirements of section 30.8(2) and 30.8(3) of the *Regulation*.

**Small laboratories and mobile laboratories**
Sections 30.8(2) and 30.8(3) of the *Regulation* respectively specify minimum air flows and placement considerations for laboratory fume hoods. These sections may present special challenges for small laboratories or mobile laboratories, where, because of their size and inadequate air balancing, air flows through the fume hood may be significantly affected by wind conditions, and open or shut doors. To minimize disturbances of airflow patterns, the employer may need to

- Develop more detailed and more restrictive safe work procedures
- Implement more administrative controls, such as one worker in the lab at a time
- Implement engineering controls, such as double air-lock doors

Where the fume hood is still susceptible to significant cross-drafts and pressure changes despite the implementation of control measures and workers are at risk of exposure to harmful materials, the employer may need to continuously monitor the airflow in the hood. Particular care must be taken with the distribution of replacement air and movement of personnel in small laboratories. Horizontal sashes can offer better containment and splash protection than vertical sashes.

A ventilation system must be balanced to ensure that the desired airflow is or can be delivered and to accommodate typical or anticipated occupancy rates. Balancing is the process of adjusting the system, such as by altering damper positions or changing fan speed, to deliver the right amount of air at the right temperature to each space, or to provide additional make-up air to compensate for the exhausted air. The outdoor air requirements for a given indoor space will vary depending on the occupant density and the activities performed. When determining if a system is properly balanced, typical occupancy rates need to be considered. Refer to Table 2 of *ASHRAE Standard 62.1-2016* for guidance. The building may be fully occupied (close to design standards), partially occupied (significantly below design standards), or unoccupied (no workers or only a skeleton staff on duty). Note that even if the building is considered to be "unoccupied," the requirements for controlling exposure in Part 5 apply if contaminants are being generated, such as during the use of janitorial products by one or more workers after normal business hours.

If the temperature, carbon dioxide concentration and humidity level stay within acceptable ranges, the system is balanced. There is nothing to be gained by measuring airflow if the system is controlling these parameters.

#### G30.8(2.5) Certification of installation of a laboratory fume hood

Issued April 9, 2009

**Regulatory excerpt**
Section 30.8(2.5) of the *OHS Regulation* ("*Regulation*") states:

> The installation of a laboratory fume hood must be certified by a professional engineer.

**Purpose of guideline**
The purpose of this guideline is to provide guidance to employers and engineers on the factors for consideration during certification of the installation of a laboratory fume hood.

**Certification factors**
To certify the installation of a laboratory fume hood, a professional engineer is required to conduct an assessment of *Regulation* requirements related to the installation of the hood. The certification does not require an assessment of operational provisions such as those prescribed in *Regulation* subsections 30.8(5), (6), (9), and (10).

Items assessed by the professional engineer for certification of the installation should typically include:

- That the fume hood is installed in accordance with manufacturer's specifications. The professional engineer will likely refer to the specification sheet supplied with the hood, since the specifications typically outline the manufacturer's requirements for installation (see also *Regulation* section 4.3(2))
- That the hood is located within the room to avoid cross drafts (see also *Regulation* section 30.8(3) as well as the most recent edition of the following manual: *Industrial Ventilation – A Manual of Standard Practice*, published by the American Conference of Governmental Industrial Hygienists)
- That the hood is properly balanced with uniform flow (see also *Regulation* subsections 30.8(2b), (2c), and (2d))
- That the hood is properly hooked up to the exhaust system and that the exhaust system is installed in accordance with good engineering practice (see also *Regulation* subsections 30.8(2)(a) and 30.10)
- That a commercially manufactured laboratory fume hood has been factory certified to meet the appropriate containment tests (see also *Regulation* subsections 30.8(2.3) and (2.4))
- If custom built, that the hood has been tested for containment as per *Regulation* subsections 30.8(2.3) and (2.4)
- That the hood is constructed of materials compatible with its use (see also *Regulation* section 30.8(4))
- That the controls for the operation of the hood and its service features are installed in accordance with *Regulation* subsections 30.8(7) and (8)

#### G30.9 Airflow monitoring

Issued August 1999; Revised November 17, 2003; Revised February 1, 2008

**Regulatory excerpt**
Section 30.9 of the *OHS Regulation* ("*Regulation*") states:

> (1) Face velocities over the operational face opening of a laboratory fume hood must be quantitatively measured and recorded.
>
> (2) The ability of a laboratory fume hood to
>
> (a) maintain an inward flow of air across the operational face opening, and
>
> (b) contain contaminants
>
> must be assessed and recorded using a smoke tube or other suitable qualitative method.
>
> (3) The actions described in subsections (1) and (2) must be performed
>
> (a) after the laboratory fume hood is installed and before it is used,
>
> (b) at least once in each 12 month period after installation, and
>
> (c) after any repair or maintenance that could affect the air flow of the hood.
>
> (4) If a laboratory fume hood is found to be operating with an average face velocity of less than 90% of the average face velocity required in section 30.8 (2), the employer must immediately take corrective action to bring the average face velocity within the required range of velocities.
>
> (5) Airflow in a laboratory fume hood must be monitored continuously if loss of airflow will result in risk to a worker.
>
> (6) A laboratory fume hood that is being installed must have an alarm capable of indicating when the average face velocity falls below the minimum average face velocity level required in section 30.8 (2) when the hood is in use.

**Purpose of guideline**
The purpose of this guideline is to provide information about techniques to measure average face velocity. The guideline also discusses 'continuous monitoring' under section 30.9(5).

**Measuring face velocity**
Section 30.8(2) of the *Regulation* specifies fume hood exhaust ventilation rates in terms of air velocities measured over the operational face area of the hood. The operational face area is determined by the height of the sash and will vary with the work carried out in the fume hood. Section 30.9 contains rules for measuring and recording airflow.

The average air velocity is generally calculated by taking the average of measurements made over at least 6 points at the operational face of the hood with the sash raised to its highest position. If the measured average velocity is less than specified in section 30.8, repeat measurements should be made with the sash lowered successively until both the specified average air velocity, and the minimum acceptable air velocity are attained. The sash height where this is determined should be marked. A mechanical stop should be installed to prevent the sash from being raised beyond that point. The sash height should not be less than 30 centimeters (12 inches). If the minimum acceptable air velocities cannot be attained with the above procedure, modification should be made to improve the ventilation so the specified air velocities are maintained at the sash height required for the work performed.

When a sash height adjustment is necessary on a fume hood, which is part of a manifold system (several hoods serviced by a single exhaust fan), all fume hoods in the system should be rechecked at completion of all the adjustments to ensure face velocity compliance. This operation may have to be repeated several times before compliance is achieved.

Smoke tube tests will help to determine whether conditions of air turbulence exist at the face of the hood. If these conditions exist so that air spills out past the hood face, the condition should be corrected.

**Continuous monitoring of airflow**
Where there is a risk to workers in the event of loss of airflow, section 30.9(5) requires that the employer continuously monitor the airflow in a fume hood if loss of air flow would result in risk to the worker. In the context of this section, "continuous monitoring" should include both the continuous measurement of airflow through the hood or duct (usually by measuring duct static pressure or air speed) and a notification to workers of low-flow by way of an alarm, light, or other effective means. The employer should develop a safe response procedure to the alarm.

#### G30.12 Biological safety cabinets

Issued August 1999; Editorial Revision February 1, 2008; Editorial Revision April 9, 2019

**Regulatory excerpt**
Section 30.12(2) and 30.12(3) of the *OHS Regulation* ("*Regulation*") states in part:

> ...
>
> (2) Biological safety cabinets must be certified by a qualified person at least annually and before use after
>
> (a) initial installation,
>
> (b) change of the HEPA (high efficiency particulate air) filter,
>
> (c) moving of the unit, and
>
> (d) any repair or maintenance that could affect the seal of the HEPA filter.
>
> (3) Certification procedures used for compliance with subsection (2) must meet the requirements of the *National Sanitation Foundation (NSF) Standard 49-2002, Class II (Laminar Flow) Biohazard Cabinetry*, and a record of the results must be maintained.
>
> ...
>
> (6) Biological safety cabinets used for handling a biological agent must be operated and ventilated in accordance with the *Laboratory Biosafety Guidelines 3rd edition, 2004*, issued by the Public Health Agency of Canada.

**Purpose of guideline**
The purpose of this guideline is to specify another acceptable standard under section 30.12(2) of the *Regulation*. The guideline also discusses the term 'qualified person,' the field certification requirements for biological safety cabinets, and a link to access the *Laboratory Biosafety Guidelines 3rd edition*.

**Other acceptable standard**
Under sections 30.12(2) and 30.12(3) of the *Regulation*, a qualified person must certify biological safety cabinets in accordance with the requirements of *National Sanitation Foundation (NSF) Standard 49-2002, Class II (Laminar Flow) Biohazard Cabinetry*. Another acceptable standard is CSA Standard *Z316.3-M87, Biological Containment Cabinets: Installation and Field Testing*.

**Qualified person**
The definition of "qualified" is provided in section 1.1 of the *Regulation*. For the purpose of section 30.12(2), a "qualified person" is a person with knowledge, training, and experience in certification of biological safety cabinets. For example, one combination of knowledge, training, and experience that would be acceptable to WorkSafeBC would be a person who has been accredited by the National Sanitation Foundation (NSF) to perform testing of biological safety cabinetry.

**Field certification requirements**
The field (as opposed to factory) certification requirements for biological safety cabinets are listed in Annex F of the NSF standard. The tests that make up these requirements include the following:

- Downflow velocity profile test
- Inflow velocity test
- Airflow smoke patterns
- HEPA filter leak test
- Cabinet leak test (required when a cabinet is first installed, if it is relocated, or after maintenance procedures that require removal of the panels)
- Electrical leakage, ground circuit resistance, and polarity tests

- Lighting intensity test
- Vibration test
- Noise level test

A cabinet that meets the test criteria should have the following information visibly posted on the cabinet:

- Date of certification
- Date cabinet should be recertified (stated as no later than a specified date)
- Number of the certifier's report (a reference document showing the tests performed and the results. WorkSafeBC would accept an alternative means of readily locating the certifier's report, such as the serial number of the cabinet)
- Name, address, and telephone number of the certifying company
- Signature of the qualified person who performed the field certification tests

**Biological agents**
A biological safety cabinet for handling a biological agent designated as a hazardous substance under section 5.1.1 of the Regulation must be operated and ventilated in accordance with the *Laboratory Biosafety Guidelines 3rd edition (2004)*. This manual can be accessed on publications.gc.ca.

#### G30.13 Centrifuges

Issued August 1999; Editorial Revision September 28, 2022

**Regulatory excerpt**
Sections 30.13(3) and (4) of the *OHS Regulation* ("*Regulation*") states:

> (3) Unless exempted by CSA Standard C22.2 No. 151-M1986 Laboratory Equipment, or other standard acceptable to the Board, centrifuge doors must be interlocked to prevent workers accessing spinning rotors.
>
> (4) The interlock required by subsection (3) must prevent the door from opening while the rotor is spinning or cause the rotor to brake if the door is opened, or another equally effective means must be used to prevent a worker from accessing the spinning rotor.

Section 4.4(2)(a) of the *Regulation* states:

> (2) When this Regulation requires a person to comply with
>
> (a) a publication, code or standard of the Board or another agency, the person may, as an alternative, comply with another publication, code or standard acceptable to the Board …

**Purpose of guideline**
The purpose of this guideline is to provide information regarding the interlocking requirements set out in section 30.13(3) of the *Regulation*, and the requirements for the exemption provided in *CSA Standard C22.2 No. 151-M1986*.

**Access cover interlocks**
*CSA Standard C22.2 No. 151-M1986* requires an interlock on a centrifuge where $E_{max}$ exceeds 1 kilojoule. For these centrifuges, the access cover catch must be locked in the engaged position when the motor is energized and it must remain locked until the energy level drops to 1 kilojoule or less.

**Exemptions**
For centrifuges where $E_{max}$ is less than 1 kilojoule, a readily accessible lever or knob can be used for releasing the access cover catch, so long as it is designed to minimize the chance of unintentional operation. The CSA Standard requires that, where a lever or knob is provided for releasing the catch on an access of a centrifuge, the following warning statement must be prominently marked adjacent to the lever or knob:

**WARNING: DO NOT OPEN THE ACCESS COVER UNTIL THE HEAD HAS STOPPED**

**Other standards acceptable to WorkSafeBC**
Section 4.4(2)(a) of the *Regulation* provides WorkSafeBC the authority to accept alternative standards to those listed in the *Regulation*. *CSA Standard C22.2 No. 151-M1986* has been withdrawn, and replaced with *CSA Standard C22.2 61010-1-04 — Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory Use — Part 1: General Requirements* and *CSA Standard C22.2 61010-2-020:17 — Electrical Equipment for Measurement, Control, and Laboratory Use — Part 2-020: Particular Requirements for Laboratory Centrifuges*. Exemptions specified in *CSA Standard C22.2 61010-2-020:17* provide an acceptable alternative for the purpose of complying with section 30.13(3).

#### G30.29 Electrophoresis

Issued August 1999; Editorial Revision April 14, 2022

**Regulatory excerpt**
Section 30.29(1) of the *OHS Regulation* ("*Regulation*") states:

(1) Electrophoresis apparatus must be designed and maintained so that any hazardous electrical current is shut off when the cover is opened.

**Purpose of guideline**
The purpose of this guideline is to highlight section 30.29(1) of the Regulation that requires electrophoresis equipment be designed and maintained so that any hazardous electrical current is shut off when the cover is opened.

**Hazardous electrical current**
For the purpose of this section, "hazardous electrical current" is any current that is large enough to startle a worker. Even low levels of current may startle a worker and cause an inadvertent action. Refer to the booklet Working Safely Around Electricity for the effects of electrical current on the human body.

**Cover**
The cover referred to in this section is any physical barrier that prevents access to any hazardous electrical energy during operation. In some commercial electrophoresis systems, this may be the cover of the sample tray or carrier; in other systems, the cover may be over an electrolyte solution or gel.